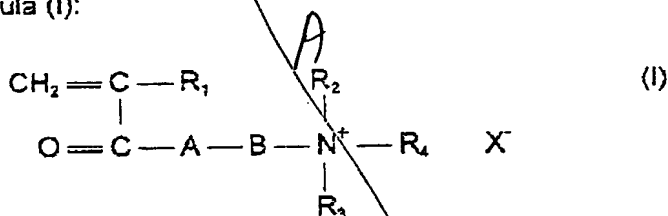


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Claims

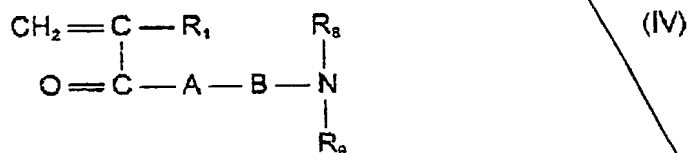
1. A process for the production of paper from a suspension containing cellulosic fibres, and optional fillers, comprising adding to the suspension drainage and retention aids comprising a cationic organic polymer and anionic microparticulate material, forming and dewatering the suspension on a wire, characterised in that the cationic organic polymer has a non-aromatic hydrophobic group which is an alkyl group containing at least 3 carbon atoms selected from n-propyl, iso-propyl, n-butyl, iso-butyl, t-butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl and dodecyl.

2. A process for the production of paper from a suspension containing cellulosic fibres, and optional fillers, comprising adding to the suspension drainage and retention aids comprising a cationic organic polymer and anionic microparticulate material, forming and dewatering the suspension on a wire, characterised in that the cationic organic polymer comprises in polymerized form one or more monomers comprising at least one monomer having a non-aromatic hydrophobic group selected from
(i) a cationic monomer having a non-aromatic hydrophobic group represented by the general formula (I):



wherein R_1 is H or CH_3 ; R_2 and R_3 are each H or an alkyl group having from 1 to 3 carbon atoms; A is O or NH; B is an alkylene group of from 2 to 8 carbon atoms or a hydroxy propylene group; R_4 is a substituent containing a non-aromatic hydrophobic group containing from 3 to 12 carbon atoms; and X^- is an anionic counterion;

(ii) a non-ionic monomer having a non-aromatic hydrophobic group represented by the general formula (IV):



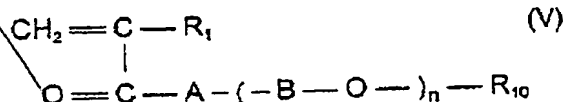
wherein R_1 is H or CH_3 ; A is O or NH; B is an alkylene group of from 2 to 8 carbon atoms or a hydroxy propylene group or, alternatively, A and B are both nothing whereby there is a single bond between C and N ($\text{O}=\text{C}-\text{NR}_8\text{R}_9$); R_8 and R_9 are each H or a substituent containing a non-aromatic hydrophobic group having from 1 to 6 carbon atoms, at least one

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of R_8 and R_9 being a substituent containing a hydrophobic group having from 2 to 6 carbon atoms; and

(iii) a non-ionic monomer having a non-aromatic hydrophobic group represented by the general formula (V):

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wherein R_1 is H or CH_3 ; A is O or NH; B is an alkylene group of from 2 to 4 carbon atoms; n is an integer of at least 1; R_{10} is a substituent containing a hydrophobic group having at least 2 carbon atoms.

3. A process according to claim 1 or 2, characterised in that the cationic organic polymer is a vinyl addition polymer comprising in polymerized form at least one non-cationic monomer having a non-aromatic hydrophobic group and at least one cationic monomer.

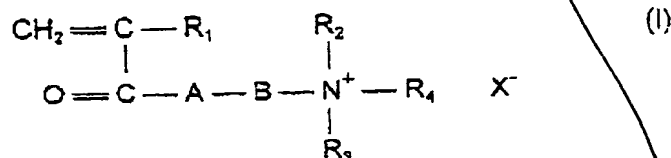
4. A process according to claim 1, 2 or 3, characterised in that the hydrophobic group is attached to a nitrogen or oxygen which, in turn, is attached to the polymer backbone via a chain of atoms.

5. A process according to claim 1, 2, 3 or 4, characterised in that the hydrophobic group is an alkyl group containing from 4 to 8 carbon atoms.

6. A process according to any of the preceding claims, characterised in that the cationic organic polymer is an acrylamide-based polymer.

7. A process according to any of the preceding claims, characterised in that the cationic organic polymer comprises in polymerized form a cationic monomer having a non-aromatic hydrophobic group represented by the general formula (I):

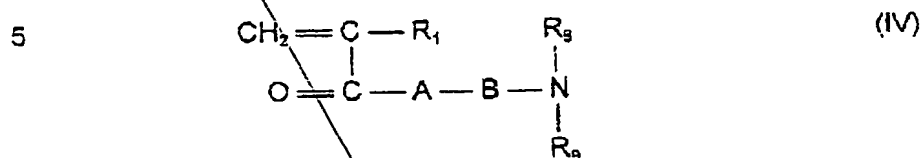
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35 wherein R_1 is H or CH_3 ; R_2 and R_3 are each an alkyl group having from 1 to 2 carbon atoms; A is O or NH; B is an alkylene group of from 2 to 4 carbon atoms or a hydroxy propylene group; R_4 is a substituent containing an alkyl group containing from 4 to 8 carbon atoms; and X^- is an anionic counterion.

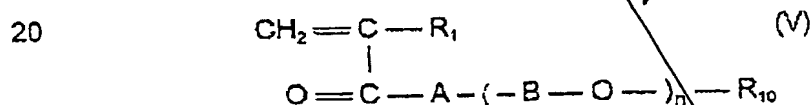
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8. A process according to any of the preceding claims, characterised in that the cationic organic polymer comprises in polymerized form a non-ionic monomer having a non-aromatic hydrophobic group represented by the general formula (IV):



wherein R_1 is H or CH_3 ; A is O or NH; B is an alkylene group of from 2 to 4 carbon atoms or a hydroxy propylene group or, alternatively, A and B are both nothing whereby there is a single bond between C and N ($\text{O}=\text{C}-\text{NR}_8\text{R}_9$); R_8 and R_9 are each H or a substituent containing an alkyl group having from 1 to 6 carbon atoms, at least one of R_8 and R_9 being a substituent containing an alkyl group having from 3 to 4 carbon atoms.

9. A process according to any of the preceding claims, characterised in that the cationic organic polymer comprises in polymerized form a non-ionic monomer having a non-aromatic hydrophobic group represented by the general formula (V):



wherein R_1 is H or CH_3 ; A is O; B is an alkylene group of from 2 to 4 carbon atoms; n is an integer of at least 1; R_{10} is alkyl having at least 2 carbon atoms.

10. A process according to any of the preceding claims, characterised in that the cationic organic polymer is a vinyl addition polymer prepared from a monomer mixture comprising from 5 to 25 mole% of monomer having a non-aromatic hydrophobic group, and from 95 to 75 mole% of other copolymerizable monomers.

11. A process according to any of the preceding claims, characterised in that the anionic microparticulate material is selected from silica-based particles and bentonite.

12. A process according to any of the preceding claims, characterised in that the drainage and retention aids further comprises a low molecular weight cationic organic polymer.

13. A process according to any of the preceding claims, characterised in that the suspension that is dewatered on the wire has a conductivity of at least 2.0 mS/cm.

14. A process according to any of the preceding claims, characterised in that the process further comprises dewatering the suspension on a wire to obtain a wet web of paper and white water, recirculating the white water and optionally introducing fresh water to form a suspension containing cellulosic fibres, and optional fillers, to be dewatered, wherein the amount of fresh water introduced is less than 30 tons per ton of dry paper produced.

15. A process according to any of the preceding claims, characterised in that less than 10 tons of fresh water is introduced into the process per ton of dry paper produced.

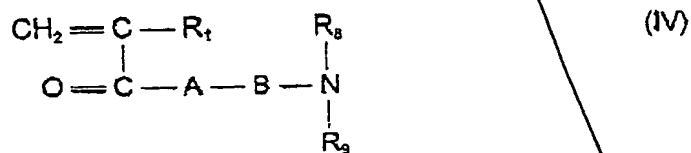
16. A cationic vinyl addition polymer comprising in polymerized form at least one non-cationic monomer having a non-aromatic hydrophobic group, at least one cationic monomer and (meth)acrylamide, wherein the cationic vinyl addition polymer is prepared from a monomer mixture comprising from 75 to 95 mole% of (meth)acrylamide.

17. A cationic vinyl addition polymer according to claim 16, characterised in that the (meth)acrylamide is acrylamide.

18. A cationic vinyl addition polymer according to claim 16 or 17, characterised in that the non-aromatic hydrophobic group is attached to a nitrogen or oxygen which, in turn, is attached to the polymer backbone via a chain of atoms.

19. A cationic vinyl addition polymer according to claim 16, 17 or 18, characterised in that the non-aromatic hydrophobic group is an alkyl group containing from 3 to 12 carbon atoms.

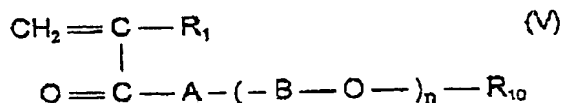
20. A cationic vinyl addition polymer according to claim 16, 17, 18 or 19, characterised in that the cationic vinyl addition polymer comprises in polymerized form a non-ionic monomer having a non-aromatic hydrophobic group represented by the general formula (IV):



wherein R_1 is H or CH_3 ; A is O or NH; B is an alkylene group of from 2 to 4 carbon atoms or a hydroxy propylene group or, alternatively, A and B are both nothing whereby there is a single bond between C and N ($\text{O}=\text{C}-\text{NR}_8\text{R}_9$); R_8 and R_9 are each H or a substituent containing an alkyl group having from 1 to 6 carbon atoms, at least one of R_8 and R_9 being a substituent containing an alkyl group having from 2 to 6 carbon atoms.

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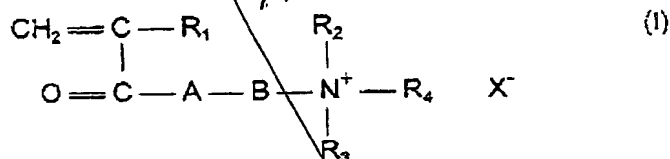
21. A cationic vinyl addition polymer according to any of claims 16 to 20, characterised in that the cationic vinyl addition polymer comprises in polymerized form a non-ionic monomer having a non-aromatic hydrophobic group represented by the general formula (V):



wherein R_1 is H or CH_3 ; A is O or NH; B is an alkylene group of from 2 to 4 carbon atoms; n is an integer of at least 1; R_{10} is alkyl having at least 2 carbon atoms.

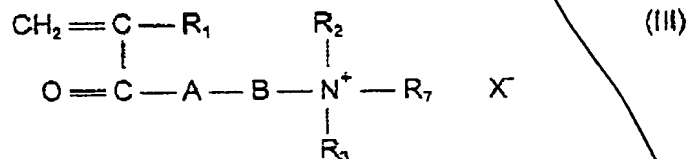
22. A cationic vinyl addition polymer according to any of claims 16 to 21, characterised in that the non-aromatic hydrophobic group is an alkyl group selected from n-propyl, iso-propyl, n-butyl, iso-butyl and t-butyl.

23. A cationic vinyl addition polymer according to any of claims 16 to 22, characterised in that the cationic vinyl addition polymer comprises in polymerized form a cationic monomer represented by the general formula (I):



wherein R_1 is H or CH_3 ; R_2 and R_3 are each H or an alkyl group having from 1 to 3 carbon atoms; A is O or NH; B is an alkylene group of from 2 to 4 carbon atoms or a hydroxy propylene group; R_4 is a non-aromatic hydrocarbon group containing from 4 to 8 carbon atoms; and X^- is an anionic counterion.

24. A cationic vinyl addition polymer according to any of claims 16 to 23, characterised in that the cationic vinyl addition polymer comprises in polymerized form a cationic monomer represented by the general formula (III):



wherein R_1 is H or CH_3 ; R_2 and R_3 are each H or an alkyl group having from 1 to 3 carbon atoms, suitably 1 to 2 carbon atoms; A is O or NH; B is an alkylene group of from 2 to 8

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carbon atoms, suitably 2 to 4 carbon atoms, or a hydroxy propylene group; R_7 is H, an alkyl group having from 1 to 3 carbon atoms, a benzyl group or a phenylethyl group; and X^- is an anionic counterion.

25. A cationic vinyl addition polymer according to any of claims 16 to 24, characterised in that the cationic vinyl addition polymer is prepared from a monomer mixture comprising from 5 to 25 mole% of non-ionic monomer having a non-aromatic hydrophobic group, and from 95 to 75 mole% of other copolymerizable monomers.

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